Claims

1. A method of operation of a stack for electric power generation made up of at least one membrane fuel cell, comprising feeding non-humidified air at the cathode inlet with stoichiometric factor higher than 1 and temperature not higher than 35°C and discharging exhaust air at the cathode outlet.

2. The method of claim 1 wherein the temperature of said non-humidified cathode air feed is comprised between 23 and 27°C.

3. The method of anyone of the previous claims wherein said non-humidified cathode air feed is obtained by cooling ambient air.

4. The method of claim 3 wherein said ambient air has an initial temperature not higher than 45°C.

5. The method of anyone of the previous claims further comprising a temperature control of said cathode exhaust air discharge as a function of the pressure of said non-humidified cathode air feed.

6. The method of claim 5 wherein said control is effected by a coolant maintaining said temperature of said cathode air discharge comprised between 60 and 70°C with said non-humidified cathode air feed having a pressure comprised between 1 and 1.5 bar absolute and a stoichiometric factor comprised between 1.2 and 3.

7. The method of anyone of claims from 3 to 6 wherein said ambient air cooling is obtained by means of a device which carries out a compression, a subsequent thermal exchange in a heat exchanger and a final expansion.

8. The method of claim 7 wherein said thermal exchange utilises ambient air as the coolant.

9. The method of claim 7 or 8 wherein said compression is effected up to a final pressure comprised between 1.1 e 1.5 bar absolute.

10. The method of anyone of claims from 7 to 9 wherein said final expansion supplies air at a pressure comprised between 1 and 1.1 bar absolute.

11. The method of anyone of claims from 7 to 10 wherein said thermal exchange cools said compressed air from a temperature lower than 80°C to a temperature comprised between 47 and 53°C.

12. The method of anyone of claims from 7 to 11 wherein said expansion produces mechanical work reused in said compression.

13. The method of anyone of claims from 7 to 12 wherein said device has an overall energy consumption not higher than 8% of the electric power generated by said stack.

14. A fuel cell system comprising at least one fuel cell stack for electric power generation cathodically fed with air coming from a conditioning device comprising at least one fan or compressor, at least one heat exchanger and at least one expander.

15. The system of claim 14 wherein said cathode air feed of said stack has a stoichiometric factor comprised between 1.2 and 3.

16. The system of claim 14 o 15 wherein said at least one expander is a rotating expander.

17. The system of anyone of claims from 14 to 16 wherein said expander has a delivery temperature comprised between 23 and 27 °C and a delivery pressure comprised between 1 and 1.1 bar absolute.

18. The system of anyone of claims from 14 to 17 wherein said conditioning device supplies said fan or compressor reusing the mechanical work produced by said expander.

19. The system of anyone of claims from 14 to 18 wherein said heat exchanger is suited to achieve the cooling of air coming from said fan or compressor by heat exchange with ambient air.

20. The system of anyone of claims from 14 to 19 wherein said heat exchanger has a delivery temperature comprised between 47 and 53°C.

21. The system of anyone of claims from 14 to 20 wherein said fan has a delivery pressure comprised between 1.0 and 1.5 bar absolute.

22. The system of anyone of claims from 14 to 21 wherein said conditioning device has an energy consumption not higher than 8% of the electric power generated by said stack.